

## CLAIMS

1. A receiver for receiving a signal of a desired user, which signal may arrive at the receiver in different components along several different paths at several different delays, the receiver comprising

5 an antenna array composed of more than one element for receiving the signal,

one or more rake branches for demodulating the received signals,

10 at least one search branch adapted to calculate the two-dimensional impulse response of the received signal by searching for the incoming directions and delays of the received signal components, and to transmit information on the most favorable components found to the rake branches,

and in which at least one rake branch comprises

15 a number of beam formers, and a number of correlators coupled to the outputs of the beam formers, and a demodulator coupled to the outputs of the correlators,

a code generator for generating the codes required by the correlators,

20 control means adapted to control the operation of the code generator and the beam formers, to which control means information is received from the search branch about the incoming direction and delay of the signal component, and

25 calculation means whose inputs comprise the outputs of the correlators, the calculation means being adapted to calculate and transmit to the control means, on the basis of the outputs of the correlators, information on how the code generator and the beam formers are to be controlled.

2. A receiver as claimed in claim 1, comprising at least one first beam former and correlator, which receive the desired signal using the direction and delay calculated for this purpose.

30 3. A receiver as claimed in claim 2, comprising a calculation means adapted to calculate control information for the code generator and the beam formers such that the correlation value indicated by the output signal of the first correlator is as high as possible.

35 4. A receiver as claimed in claim 2, comprising a calculation means adapted to calculate for the code generator a phase change and for the beam formers an angular change such that the correlation value indicated by the

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output signal of the first correlator is as high as possible.

5. A receiver as claimed in claim 1, comprising a calculation means adapted to calculate control information for the code generator and the beam formers at predetermined intervals.

5 6. A receiver as claimed in claim 2, comprising a number of correlators adapted to calculate the correlation from the calculated incoming direction and from the left and right sides of the incoming direction of the desired signal component.

10 7. A receiver as claimed in claim 6, comprising a calculation means adapted to calculate the control signal of the beam formers such that in case the correlation result calculated from the left or right side of the incoming direction is higher than the correlation result obtained from the calculated incoming direction, the first beam former is controlled to receive the signal from said direction.

15 8. A receiver as claimed in claim 2, comprising a number of correlators adapted to calculate the correlation before and after the calculated delay of the desired signal component.

20 9. A receiver as claimed in claim 8, comprising a calculation means adapted to calculate the control signal of the code generator in such a way that if the correlation result calculated before and after the calculated delay of the desired signal component is higher than the correlation result obtained from the calculated delay, the code generator is controlled in the direction of said delay value.

25 10. A receiver as claimed in claim 1, whose rake branch comprises a noise code generator and a number of correlators which are coupled to the outputs of the beam formers and to whose input is coupled the output of the noise code generator, and a demodulator coupled to the output of the correlators, the demodulator being adapted to calculate the noise level from the calculated incoming direction of the desired signal component.

30 11. A receiver as claimed in claim 1, comprising different beam formers and correlators for signals of branch I and Q.

12. A receiver as claimed in claim 11, comprising a code generator that generates the following codes having different phases:

- 35
- on-time I,
  - on-time Q,
  - late I,

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- early Q.

13. A method of receiving a signal of a desired user, which signal may arrive at the receiver in different components along several different paths at several different delays, the method comprising

5 receiving the signal by an antenna array composed of more than one element,

demodulating the signal components by one or more rake branches,

10 calculating the two-dimensional impulse response of the received signal by searching for the incoming directions and delays of the received signal components,

determining the most favorable signal components,

transmitting information on the signal components found to the rake branches,

15 processing the signal at each rake branch by a beam former in such a way that the output of the beam former comprises a signal component received from a desired direction,

correlating the output signal of the beam former in correlators,

demodulating the correlated signal,

20 generating codes required by the correlators by a code generator,

controlling the code generators and beam formers on the basis of the incoming direction and delay of the signal component,

25 monitoring the incoming direction and delay variation of the signal component on the basis of the output signals of the correlators, and controlling the code generator and the beam formers by means of said monitoring.

14. A method as claimed in claim 13, comprising controlling the code generator and the beam formers such that the correlation value indicated by the output signal of the correlator to which the signal received from the desired direction has been applied is as high as possible.

30 15. A method as claimed in claim 13, comprising calculating the correlation from the calculated incoming direction and from the left and right sides of the incoming direction of the desired signal component.

35 16. A method as claimed in claim 15, wherein the beam formers are so controlled that if the correlation result calculated from the left or right side of the incoming direction is higher than the correlation result obtained from the calculated incoming direction, the beam formers following the direction of the

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desired signal are controlled to receive more of the signal from said direction.

17. A method as claimed in claim 13, comprising calculating the correlation before and after the calculated delay of the desired signal component.

- 5      18. A method as claimed in claim 17, wherein the code generator is so controlled that if the correlation result calculated before and after the calculated delay of the desired signal component is higher than the correlation result obtained from the calculated delay, the code generator is controlled in the direction of said delay value.

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